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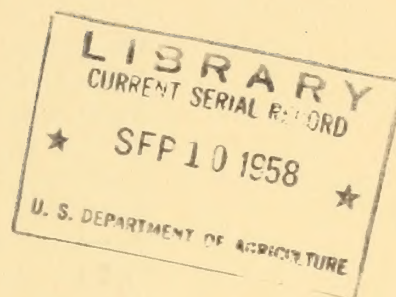


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FEDERAL-GRANT RESEARCH  
at the  
STATE AGRICULTURAL  
EXPERIMENT STATIONS



Projects on  
ENTOMOLOGY AND  
ECONOMIC ZOOLOGY  
Part 7, Section A

Agricultural Research Service  
UNITED STATES DEPARTMENT OF AGRICULTURE

Compiled May 1958 by

the State Experiment Stations Division,  
Agricultural Research Service, U. S.  
Department of Agriculture, Washington 25,  
D. C., for use of workers in agricultural  
research in the subject-matter areas  
presented. For information on specific  
research projects write to the Director  
of the Station where the research is being  
conducted.

Issued June 1958



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ENTOMOLOGY AND ECONOMIC ZOOLOGY

Section A: Field Crop Insects

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## INTRODUCTION

This compilation is one of a series providing information on State agricultural experiment station research supported by Federal-grant funds appropriated annually by Congress under authorization of the Hatch Act of 1887, as amended and approved Aug. 11, 1955, and Section 204(b) of the Agricultural Marketing Act of 1946. It is prepared for use by research workers in the subject-matter areas presented. Only that part of each State's research program supported by Federal-grant moneys is included.

In addition to the Federal-grant moneys, the State experiment stations receive some Federal support through cooperative agreements or contracts with the U. S. Department of Agriculture. Information on such research, along with other departmental research, is available in the Central Project Office, Agricultural Research Service.

A substantial part of each State agricultural experiment station's research is supported with moneys appropriated by the respective State or Territorial Legislatures and through other forms of private and public financing. Information on current agricultural research at the stations which is not financed under the Federal-grant program or through USDA cooperation can be obtained from experiment station directors.

The information given in the series of Federal-grant compilations includes the title and objectives of each Federal-grant project pertaining to the subject given on the cover. The identification of each project gives the department(s) conducting the research, the station number of the project, and the number of the regional project if it is a contributing project.

Relevant regional projects, if any, appear at the end of the compilation. States having projects contributing to regional projects are indicated. The Roman numeral (and capital letter) refer to the location in the summary of the contributing project title and objectives. The States are grouped into four major regions. These are designated NC-North Central, NE-Northeastern, S-Southern, and W-Western. The capital letter "M" following the letters for the region indicates regional marketing projects.







## FIELD CROP INSECTS

### I. General

- Ala.        The Control of Insects Attacking Corn and Grain Sorghum.  
To (1) study factors affecting seasonal abundance of important insect pests; (2) cooperate with plant breeders in selecting varieties and strains resistant to attack, particularly the rice weevil; and (3) develop control measures for use in the field and in storage.  
Ent., Zool. 314
- Ark.        Biology and Control of White Grubs in Arkansas. To make a detailed investigation of biology and insecticidal control of white grubs which are most abundant in Arkansas, including the genus Phyllophaga, as well as Cyclocephala, Cotinis, and others.  
Ent. 266
- Colo.        Investigation for the Control on Rangeland Grasshoppers.  
(1) Habits and seasonal histories of the following grasshoppers; warrier, Camnula pellucida (Scudder); big-headed grasshopper, Aulocara elliotti Thomas; Ageneottetix deorum Bruner; Aeoloplus turnbulli Caudell and Philibostroma quadrimaculata (Thomas), will be investigated in northeastern and southcentral Colorado. (2-4 To learn) (2) influence of overgrazing, drouth, shifts in vegetational features and insecticides on population densities of the 5 species, (3) food preference, feeding habits, and seasonal activity as related to rangeland vegetation, (4) effects of rangeland management practices on grasshopper populations.  
Ent. 234 (W-37)
- Conn.       Factors Affecting The Establishment and Survival of Wireworms in the Soil. (1) Learn factors affecting establishment of wireworms in soil. (2) Evaluate relative importance of these factors and their basic operation. (3) Learn factors affecting survival of wireworms in soil. (4) Evaluate relative importance of factors and their basic operation.  
Pl. Path., Soils, Anal. Chem. 313
- Ga.        Control of Soil Inhabiting Insects Affecting Field Crops.  
(1) Learn the principal soil inhabiting insects injurious to corn. (2) Develop control measures for important soil inhabiting insect pests. (3) Study life history of certain pests as an aid in developing control measures.  
Ent. 71 Coop. ARS



Ga.        Control of Insects Attacking Peanuts and Tobacco. To develop effective methods to: (1) reduce damage done to peanuts by insects feeding on foliage and on roots and nuts; and (2) learn regular spray and dust schedules for control of budworm, hornworm, and green peach aphid on tobacco.

Ent. 215

Idaho      Economic Importance and Ecological Factors Influencing Grasshopper Species of Idaho. To (1) survey the area involved to collect grasshopper species and from these collections develop key for identification of species; (2) study life histories of more important range species to determine if parthenogenesis occurs and is a contributing factor to sporadic outbreaks; (3) study host plant preferences of important grasshopper species; (4) learn ecological factors influencing grasshopper population densities with special emphasis on physical environmental factors; and (5) make range studies to learn damage or destruction of range grasses and other desirable forages and determine grasshopper population densities which would endanger or inhibit natural and artificial range reseeding, with emphasis on burned-over areas.

Ent. 289 (W-37) Coop. ARS

Ill.        Migration of the Potato Leafhopper and Its Causes. To learn (1) if potato leafhopper, does overwinter in Illinois, (2) time of 1st appearance of leafhopper in various parts of state, correlate information with similar data from adjacent states and establish migration paths and patterns, (3) relative importance of climatic and other ecological conditions on rapidity with which leafhopper populations develop and spread following arrival of migrants.

Ent., Agron. 12-314 (NC-29) Coop. ARS

Kans.      The Resistance of Crop Plants to Insect Injury. To (1) incorporate resistance to one or more insects into agronomically desirable, high yielding new strains of crop plants; (2) study causes of resistance and number and manner of inheritance of genes for resistance; and (3) study effect of resistant varieties on population levels of insects involved.

Ent., Agron. 164 Coop. ARS

Kans.      The Use of Chemicals and Cropping Practices for the Control of Subterranean Crop Pests. To determine effectiveness of chemicals and cropping practices when used as control measures against insects attacking planted seeds and underground parts of crop plants.

Ent. 289

Ky.

The Biology and Control of Mites and Armyworms Attacking Cereal and Forage Crops. To (1) determine mite species involved in various crops and evaluate economic importance; (2) study relationship of various mite population with reference to insecticide(s) used; (3) study influence of mite predators or other biological control factors on population; (4) evaluate acaracides and make recommendations on control; (5) study causes of armyworm outbreaks and possibilities for predicting infestations; (6) study control methods and evaluate insecticides for effective control; and (7) make residue studies of treated crops.

Bot., Ent. 454 (S-25)

Ky.

Biology and Control of Grasshoppers. To (1) develop and evaluate sprays and dusts as substitutes for poison bait as a control measure for grasshoppers on forage crops and tobacco, (2) forecast in what areas grasshopper damage may occur by making fall surveys of egg abundance, and (3) study biology and species distribution of grasshoppers in relation to outbreaks of blister beetles.

Ent., Bot. 457

Minn.

Causes of Outbreaks of the Potato Leafhopper, Empoasca fabae (Harris). Cooperate with North Central Regional Project on "Migration of Potato Leafhopper and Its Causes." Obtain records of 1st appearance in spring and abundance during growing season. Study relation of ecological factors to populations. Learn role of host plant relationships in population buildup and migration. Ascertain causes of outbreaks and migrations so as to predict abundance. Develop more effective control measures.

Ent., Zool., Hort. 1734 (NC-29) Coop. ARS

Miss.

Control of the Imported Fire Ant. (1) Test effectiveness of area treatments of granular and fertilizer formulations of dieldrin and other insecticides as compared to sprays. (2) Learn effect of timing and soil preparation of above treatments. (3) Try to find some material to serve as an attractant for bait treatment for control of pest.

Ent. HH-13



- Mo.            Investigations of the Biology and Control of Field Crop Insects with Special Emphasis on the Corn Earworm, Hessian Fly, Grasshoppers, European Corn Borer and Primary Soybean Insects. To (1) make studies of life histories and seasonal abundance of important insect pests of soybeans and learn population levels justifying insecticidal control, (2) apply soil insecticides to land before planting to soybeans, to control soil-infesting insects, (3) make observations on soybean fields, sprayed, to learn effect on insect pests and insect parasites and predators, (4) use experimentally, new insecticides for control of bean leaf beetle, corn earworm, clover leaf worm, etc. (5) study control of legume insects with insecticides, (7) study migration of potato leafhopper and its causes, (10) consider seed treatment with soil insecticides, (11) investigate control of Hessian fly, with insecticides, (13) investigate soil insecticides on corn and small grains, and (14) study insecticidal control of grasshoppers.  
Ent. 102
- Mont.        The Biology and Ecology of the Economically Important Species of Grasshoppers in Montana. To study I. Factors affecting grasshopper distribution. II. Factors affecting fluctuations in grasshopper numbers. III. Behavior Patterns of various grasshopper species. IV. Damage to forage by grasshopper species.  
Zool., Ent. M.S. 926 46 (W-37)
- Mont.        The Improvement of Barley in Montana Through the Development of Superior Varieties and Cultural Practices. To (1) determine adaptation of new and introduced barley varieties and selections, (2) develop, by hybridization and selection, varieties superior to those now grown in Montana, (3) develop and improve cultural methods, (4) develop new uses and expand former uses for barley thru plant breeding, (5) search for basic information for most feasible and economical means of accomplishing these objectives.  
Agron. 152 MS 953 Coop. ARS
- N. J.        Soil Pest Investigations. To study soil-infesting insects, garden centipedes, and nematodes that attack vegetable crops; and learn their distribution, biology and control.  
Ent., Soils 181
- N. Dak.      Biology and Ecology of North Dakota Grasshoppers. Learn (1) distribution of all economically important grasshopper species and associate distribution of each species with major vegetative types and sub-types; (2) seasonal histories of economically important crop land species.  
Ent. 5-7

- Tenn.      A Study of the Life History, Ecology, and Control of Army Worms, *Pseudaletia Unipuncta*, and Related Species. To emphasize the various factors governing the abundance of this species, which appears suddenly and sporadically, inflicting damage before the farmer is aware of their presence, so that with a better understanding of these factors it may be possible to forecast outbreaks.  
Ent. 97 (S-25)
- W. Va.      Cereal and Forage Crop Pests - Their Distribution, Incidence and Control in West Virginia. To (1) determine distribution, incidence and to estimate the economic importance of the principal field and forage crop pests (insects, mites and nematodes) in the State; and (2) devise effective control measures for those pests found to be doing economic damage.  
Pl. Path., Ent. 80
- Wis.      The Role of Ecological Factors in Outbreaks of the Potato Leafhopper. To (1) cooperate on regional project, (2) obtain records of first appearance of the leafhopper and follow its seasonal abundance, (3) evaluate more accurately the environmental and physiological factors that determine leafhopper populations, (4) associate seasonal populations with regional leafhopper survey and develop system for predicting normal and abnormal populations, (5) develop consistent method to forecast outbreaks with higher degree of accuracy.  
Ent. 196 (NC-29)
- II. Cereal Insects
- Ark.      Biology and Control of the Southwestern Corn Borer in Arkansas. (1) Further development of cultural and insecticidal control for southwestern corn borer. Project will include a study of severity of damage in different areas of state.  
Ent., Agron. 350
- Ark.      Ecology and Control of the Sugar Cane Beetle (Rough-Headed Corn Stalk Beetle). To (1) develop an effective and practical insecticidal control, (2) arrive at an understanding of insect's ecological needs as a prerequisite to control through management, identifying areas prone to attack, and learning conditions favorable for outbreaks.  
Ent. 458
- Fla.      Corn Breeding. To (1) breed improved corn hybrids, with emphasis on higher yields, better standability, and more insect and disease resistance; and (2) study comparative efficiency of different breeding methods.  
Agron. 374



Fla.            Small Grain Improvement by Breeding and Selection. (1) Develop high yielding adapted varieties of small grains possessing desirable agronomic characteristics for grain and forage production with resistance to major disease and insect pests, (2) Conduct studies on diseases and inheritance of disease resistance and agronomic characters to develop a more effective breeding program; determine reliable methods of evaluating breeding lines for their forage production.

Agron., Pl. Path. 783

Ga.            Variety Testing, Breeding, and Culture of Grain Sorghums In Georgia. To (1) determine adaptation of existing varieties and strains, (2) breed varieties for high yielding ability, disease resistance, quality, and other agronomic characters and investigate feasibility of developing grain sorghum hybrids for commercial production, (3) learn proper planting date for grain sorghums, (4) learn proper row spacing and seeding rate, (5) learn most economical fertilizer practice, (6) learn varietal types best suited for combining and effect combining has on grain moisture content, and (7) evaluate insect damage and devise control means.

Agron. 30

Ga.            Corn Breeding. To develop high yielding white and yellow corn hybrids and varieties well adapted to various soil and climatic conditions of Georgia.

Agron. 34

Idaho          Biology, Ecology and Control of Insects Affecting Dryland Cereals. To (1) survey dryland grain growing areas to determine insect species present, their abundance and economic importance; (2) make detailed studies on life histories of those found to be major pests; (3) make detailed studies on ecologies of major pests to find how ecological factors influence their abundance and degree of economic damage; and (4) develop practical control measures for all major economic species.

Ent. 267

Ind.           Soft Winter Wheat Breeding, Genetics, and Pathology. (1) Develop highly productive, pastry quality soft winter wheat varieties, adapted to production under high fertility conditions and resistant to weather, disease, and insect hazards. (2) Learn relations and interrelations of plant characters with respect to yield and adaptation. (3) Analyze inheritance of plant characters contributing to field performance; (4) resistance to hessian fly and wheat diseases. (5) Evaluate superior sources of and characterize resistance to major diseases and insects. (6) Provide data on significance, epidemiology, and genetics of virulence of causal organisms. (7) Evaluate chemical and physical methods of disease control.

Bot., Pl. Path., Agron. 969 Coop. ARS



Iowa

The Development of Improved Corn Hybrids. To (1) produce superior inbred lines of corn for different sections of Iowa and the Corn Belt; (2) evaluate lines for combining ability, resistance to or tolerance of major corn insects, resistance to important plant pathogens, and nutritional and industrial characteristics; (3) compare breeding procedures as to relative efficiency in obtaining desired characteristics to the maximum; (4) use existing data and new data to find most efficient procedures for conducting trials for yield or other desirable agronomic characters; and (5) conduct needed basic studies to facilitate attainment of above objectives.

Agron., Bot., Pl. Path., Chem., Ent. 1140 Coop. ARS

Iowa

The Effect of Time of Planting, Weather Conditions and Character of Plant Growth on Corn Borer Populations. To (1) study differences in resistance or susceptibility between widely different strains of field corn planted at widely different dates and for both generations of borer; (2) study effect of planting date on both first and second generation borer accumulation; and (3) measure damage done per borer, by first and second generation borers, and by total borers, under different infestation levels, and for different strains of field corn.

Ent. 1193 (NC-20) Coop. ARS

Kans.

Hessian Fly and Other Insects Attacking the Growing Wheat Plant Above Ground. To (1) study insect infestation and abundance of wheat fields in relation to climatic conditions and farm practices. (2) collect and identify the insects, and study life histories of insects, affecting the living wheat plant above ground. (3) Measure injury done and where necessary workout control measures for each species. As opportunities are available, this will include the testing of new insecticides.

Ent. 283 Coop. ARS

Kans.

The Corn Earworm and Other Insects. To (1) study infestation of corn earworm and other insects as to abundance in fields as related to climatic conditions and farm practices, (2) determine life history and habits of injurious insects in corn fields, and (3) study control measures, cultural and insecticidal, for various pests.

Ent. 284

Kans.

Biology and Control of Insects Affecting Sorghums. Learn behavior, type and extent of injury, and control of insects attacking sorghum.

Ent. 432

Kans. Factors Influencing European Corn Borer Populations. Measure annual populations and observe changes in population in Kansas as compared to other north-central states; learn presence or absence of synchronization of changes in population; and study influence of weather conditions, biotic-controlling factors and soil management on borer populations.

Ent. 440 (NC-20)

Kans. Development and Testing of Rapid Inspection Methods for Insect and Rodent Contamination in Wheat and Wheat Products Suitable for Market Grading. Originate, develop, and test techniques to learn presence of internal insect infestation and contamination due to rodents in grains suitable for use under United States Grain Standards.

Flour and Pd. Mill. ES 459 Coop. AMS, HEW-FDA

Ky. Life History and Control of the European Corn Borer (Pyrausta Nubilalis) with Special Reference to Field Corn.

To (1) determine habits of corn borer under Kentucky conditions, number of generations a year, relative damage to field corn on different dates and comparative resistance of new and old inbred, single cross, and double cross corns to attack; (2) aid in control by distributing borer parasites and making parasite surveys, (3) find out extent of spread and abundance of corn borer, and (4) find out what other hosts are attacked besides corn.

Ent., Bot. 452

Ky. Biology and Control of Soil Insects Attacking Corn and Studies of the Effects of Soil Insecticides on Corn. To (1) determine relative harmful effects of soil insect pests of corn; (2) study relationships of crop rotations or cultural practices with soil-insect populations; (3) evaluate control measures; (4) study effects of insecticides on development of the plant.

Ent., Bot. 453

Minn. Corn Improvement. To study (1) production of improved hybrids for the various maturity zones in the State; (2) relative value of various methods of breeding; and (3) methods of field plot technique and improved practices.

Pl. Gen., Agron. 1311

Minn.        The Toxicity to European Corn Borer of Insecticides and an Interpretation of Their Penetration and Accumulation in Insect Cuticle. To (1) explain differences in insecticidal efficiency when applied at different temperatures, (2) explain certain insecticide concentration-temperature relationships by comparing ease of adsorption, (3) compare insecticidal efficiency on European corn borer, particularly with materials less hazardous than DDT, and (4) compare efficiency of different insecticidal forms and application methods for European corn borer.  
Ent. 1722

Minn.        Causes of Insect Outbreaks. 1. Factors Affecting Populations of European Corn Borer. To (1) make an annual census of borer abundance together with measurements of major factors of weather and biotic factors which affect borer abundance; (2) carry out experimental work aimed at elucidating operation of weather, biotic, agronomic, and soil factors on borer abundance; and (3) study effect of plant characteristics such as development, genetic make-up and physiologic conditions on the level of abundance of borers in the corn plant.  
Ent., Agron., Pl. Gen., Soil 1726 (NC-20) Coop. ARS

Miss.        The Genetic Improvement of Grain Sorghum for Production Under Humid Conditions. To develop superior varieties of grain sorghum adapted to soil and climatic conditions of this state.  
Agron. HC-5

Miss.        Control of Insects Affecting the production of Sorgo and Grain Sorghum Seed. To (1) evaluate damage done to heads of sorgo and sorghum by each species of insect in various parts of the state; (2) make seasonal history studies on species of insects, needed to work out controls; (3) note relative rate of infestation of various species on variation varieties and selections of sorgo and sorghum in efforts to find plant material resistant to insects; (4) study effect of agronomic practices which may lead to growing sorghums with least insect injury to heads; and (5) conduct toxicological studies to work out practical control of insects after using best cultural methods.  
Ent. HH-10

Mo.        Breeding Hybrid Corn for Missouri. To (1) develop agronomically superior hybrids, (2) develop hybrids for special purposes, (3) conduct investigations in pathological, entomological, and cultural problems, and in breeding techniques.  
Field Crops 85 Coop. ARS



- Mo.      Annual Testing and Breeding of Winter Barley Varieties and Strains for Yield, Winter Hardiness, and Disease Resistance, with Special Emphasis on the Smut Diseases (1954). To (1) breed better varieties adapted to Missouri conditions and to test such for hardiness, (2) discover varieties and selections resistant to disease and insects and superior in agronomic qualities and to evaluate such for use as feed, and (3) analyze the genetics governing the inheritance of characters associated with productivity, winter hardiness, disease and insect resistance.  
Field Crops 90 Coop. ARS
- Mo.      Breeding and Evaluating New Strains of Soft Wheat with Resistance to Leaf Rust, Loose Smut, and Hessian Fly. To breed an improved strain of soft wheat for Missouri, combining leaf rust, loose smut and Hessian fly resistance in a high yielding strain with good quality, using extensively N fertilizers and working for an early, short, stiff-strawed variety; and comparing any new strains originating from this project with standard varieties to find relative merits, and quality of grain by tests to learn its commercial use.  
Field Crops 202-a Coop. ARS
- Mo.      Corn Insects, with Special Emphasis on Soil Insects, the Corn Earworm, the Southwestern Corn Borer and Occasional Pests. (1) Study soil insects and arthropods with emphasis on distribution, life cycle, and destructiveness of wireworms, rootworms, cutworms, flea beetles, mites, Collembola and other arthropods. (2) Search for corn plasm resistant to Southwestern corn borer. (3) Breed field corn for resistance to corn earworm. (4) Uniform National Insecticide Control Test on corn earworm. (5) Study biology and control of occasional pests of corn that have not been of importance.  
Ent 269 Coop. ARS
- Mo.      The European Corn Borer with Special Emphasis on the Biology, Parasite and Chemical Control and Importance of the Pest in Missouri. Study factors influencing borer population as weather, and biotic controlling factors, and follow annual changes in abundance of borer and compare with other states. Collect and study parasites of borer. Evaluate insecticide control on early, mid-season and late planted corn. Collect data to learn actual reduction in yield of corn in Missouri brought about by typical low infestations of 1st and 2nd generation borers.  
Ent., Field Crops 270 (NC-20) Coop. ARS
- Mo.      Investigations of the Biology, Ecology and Control of Grasshoppers Injurious to Corn and Related Crops. Study (1) effect of weather, biological factors, cultural practices, chemical control, soil types, soil fertility etc. on insect population; (2) host plant preferences of economic species of grasshoppers; (3) habitat preferences of important crop-pasture species of grasshoppers; (4) seasonal history and habits of each of economic species of hoppers; (5) chemical control of hoppers in crop-pasture farming to learn proper timing and application of insecticides and to learn feasibility of their use.  
Ent. 286 Coop. ARS

Mont.

Oat Improvement by Breeding, Selection and Testing. To (1) develop through breeding superior oat varieties with respect to yield, quality, and other desirable agronomic characteristics; (2) test adaptability of new and introduced oat varieties and selections for Montana; and (3) provide information relative to improvement of cultural practices and production techniques.

Agron. 142, MS 929 Coop. ARS

Nebr.

Improvement of Spring Small Grains.—Oats, Barley, and Spring Wheat: And Winter Barley. To improve status of spring-sown small grain and winter barley production by 1. discovering in breeding material and among introductions of superior strains of these crops for culture under Nebraska conditions; 2. finding and using strains with superior germ plasm in breeding better adapted varieties having resistance to major hazards of production; 3. investigating quality of crops and varieties with reference to yield and value of products; 4. determining underlying principles concerned in biology of cereal plants; and (5) making small quantities of foundation seed of superior varieties available for further increase and use by citizens of Nebraska.

Agron. 19 Coop. ARS

Nebr.

A Study of the Effects of Food, Temperature and Related Factors on the Ecology and Physiological Development of Corn Rootworms. To (1) develop a satisfactory technique for mass rearing of several species of corn rootworms in greenhouse under controlled conditions; (2) determine effects of various host plants on development and fecundity of corn rootworms; and (3) develop complete synthetic diet for rootworms.

Ent. 376

Nebr.

Annual Census of European Corn Borer Populations. To study (1) annual changes in abundance of borer in two counties for a period of several years. (2) influence of weather conditions, biotic controlling factors, soil management, and irrigation practices on borer populations, (3) presence of, or lack of synchronization of, changes of borer populations in state and other study areas in North Central States.

Ent., Agron. 508 (NC-20) Coop. ARS

N.J.

Breeding and Culture of Winter and Spring Small Grains To make more efficient by breeding and better cultural practices the growing of both winter and spring small grains in N. J.

Farm Crops 259

N. C.

The Ecology, Cultural and Chemical Control of Insect Pests Of Field Corn. To determine life history of more important insects of field corn and best chemical and cultural methods for their control.

Ent. 44



N. C.            Breeding Investigations for the Improvement of Corn Strains Adapted to North Carolina. To (1) develop strains of corn which are adapted to each area in North Carolina; (2) develop methods of maintaining superior strains and aid in multiplication of such strains; (3) study breeding methods and genetic mechanisms related to corn; and (4) study inheritance of resistant factors in the host to important insects and diseases of corn under local conditions.

Agron., Field Crops 58 Coop. ARS

N. Dak.            Biology, Ecology, and Control of the Barley Thrips, Limothrips Denticornis (Haliday). Learn (1) distribution, host plants, and life history of barley thrips in N. Dak.; (2) ecological factors causing sporadic appearance of this pest in barley fields; (3) effectiveness of insecticides less hazardous than parathion; and (4) practicability of cultural and other methods of control.

Ent. 5-3

N. Dak.            Wheat Plant Structures in Relation to Wheat Stem Sawfly Resistance. Study histological structure of wheat plants as it may relate to sawfly resistance.

Ent. 5-5 Coop. ARS

N. Dak.            Hard Red Spring Wheat Improvement. To (1) search foreign wheat collections of USDA for wheat varieties and relatives carrying desirable characters lacking in presently grown commercial hard spring wheat varieties; (2) combine desirable characters by crossing with best commercial varieties and new hybrid selections of hard red spring wheat; (3) make extensive plans and head selection from crosses in segregating generations and test progenies in nursery experiments to establish superiority and adaptability to spring wheat region; (4) establish milling and baking quality characteristics of prospective new wheats; and (5) increase superior wheats for release to growers.

Agron., Cereal Technol. 6-1 Coop. ARS



N. Dak.

Breeding and Development of Corn for the Short Growing Season Areas Prevalent in North Dakota. To (1) isolate new inbred lines of corn which are adapted to the environmental conditions of the short and cool growing seasons of this area and which possess desirable agronomic characters (good ear height) and resistance to diseases (stock rot) and insects (corn borer); (2) improve the plant and seed characters and resistance to diseases and insects of inbred lines now used in early maturing hybrids by outcrossing to selected inbreds of desired character and backcrossing and/or selfing and selection; (3) introduce and study the adaptability of inbred lines originated in other Northern State Experiment Stations for use in North Dakota; (4) intercross and study combining ability and adaptability of selected inbred lines in top, single and double cross combinations as a prerequisite to the recommendation and release of new hybrids for commercial production; and (5) test reaction of North Dakota inbred lines with the cytoplasmic male sterile character for the purpose of possible use of cytoplasmic male sterility in commercial seed production.

Agron., Pl. Path. 6-6

Ohio

Breeding Field Corn for Ohio. To develop strains of corn superior to those now available in the different parts of Ohio.

Agron. 20 Coop. ARS

Ohio

The Insect Phases of the Corn Research Program. To (1) identify and obtain information on relative importance of factors influencing abundance of borers in corn plant; and (2) gain better understanding of relationships of environmental factors to fluctuations, oscillations, and levels of abundance of corn borer populations.

Ent. 111 (NC-20)

Okla.

Breeding of Disease-Resistant Wheats Adapted to Oklahoma. To breed for (1) higher yield through more and larger seeds; (2) grain with higher test weight per bushel and with satisfactory kernel appearance; (3) disease resistance; (4) cold and drought resistance; (5) stiffer straw, non-shattering, and early maturity; and (6) varieties with suitable milling and baking characteristics.

Bot., Chem., Agron. 518 Coop. ARS

Okla.

Investigations of the Biology and Control of Arthropods Attacking Small Grains. (1) Study resistance of small grain varieties to greenbug attack to learn superior germ plasm for breeding program. (2) Study insecticides to find materials less toxic to warmblooded animals, more effective at lower temperatures, more residual, more specific to injurious insects, and less expensive. Search for insecticides giving long lasting protection in seedling stage. (3) Learn most effective chemical control measures for brown wheat mite so recommendations can be made. (4) Learn effect of brown wheat mite on yield of wheat, barley, and oats. Study (5) effect of tillage, fertility, crop rotation, and variety of small grains on mite populations; (6) biology and ecology of mite so to compare conditions in this area with those in central portion of western plateaus area. (7) Learn effect of arthropods other than greenbug on yield of small grains and develop more effective methods for control.

Ent. 951

Pa.

Resistance of Hybrid Corn to Insects. To (1) develop new and improve present techniques to evaluate hybrid corn resistance and/or tolerance to these insects; European corn borer, corn leaf aphid, Japanese beetle, southern corn rootworm, seed corn maggot, thrips, seed corn beetle, and wireworms; (2) evaluate field plot corn to establish its resistance and/or tolerance to insects listed above; and (3) study influence of environmental factors on resistance, and/or tolerance of hybrid corn to insects listed above.

Ent. 911-C

Pa.

Development of Insect Resistance in Small Grains. (1) Survey and evaluate small grain varieties, including presently used Northeast varieties, for insect resistance. (2) Develop new or utilize known techniques for evaluating insect resistance and its inheritance in small grains. (3) Investigate effect of environment upon expression of insect resistance in small grains. (4) Incorporate insect resistant stock into small grain varieties as integral part of breeding program for superior agronomic and pathologic characteristics.

Agron., Ent. 1272 Coop. ARS

S. C.

Bionomics and Control of Heliothis Armigera (Hubner) as a Pest of Corn and Tomatoes. To determine factors in life history of the insect influencing its control, study physical properties of diluents and ways in which their effectiveness and usefulness may be increased, and test under field conditions combinations of chemicals and diluents showing promise of control in laboratory studies.

Ent. 123

S. Dak.

The Breeding of Superior Field Corn Hybrids. (1) Develop corn hybrids better adapted for environmental conditions of state; improve yield levels, and lodging resistance as it pertains to root and stalk weakness; work for better drought resistant hybrids; incorporate disease resistance, especially against root rot organisms; breed for insect resistance as corn borer; incorporate male sterile in hybrids available to public. (2) Develop new inbreds which, when used with each other or existing inbreds from various stations, will accomplish objectives in No. 1. (3) Study aspects of plant breeding for improving hybrids as: methods of selection and mating systems, aspects of heterosis, work on methods for developing drought-resistant inbreds, and methods for development of inbred lines thru use of chemicals and radiation. (4) Cooperate with experiment stations and USDA.

Pl. Path., Agron. 66

S. Dak.

The European Corn Borer in South Dakota. Its Control, Life History, and Distribution. To (1) determine extent and degree of infestation of the insect, (2) study life history under South Dakota conditions, (3) study parasites and predators with a view toward introduction of new species into the state for biological control of the pest, and (4) on the basis of above information determine best combination of control measures.

Ent., Zool. 187 (NC-20)

S. Dak.

Investigations of the Corn Rootworm Complex (Diabrotica spp) in South Dakota, Their Economic Importance, Life Histories, Distribution and Control. To (1) learn extent and degree of infestation of corn rootworms in South Dakota; (2) learn economic importance of the insects to the corn growers of the state; (3) study life histories under South Dakota conditions; and (4) learn best combinations of control measures with which to combat corn rootworms in South Dakota.

Ent., Zool. 247

Tenn.

Breeding for Improvement in Wheat Varieties to Include Resistance to Disease, Hessian Fly, and Changes in Morphological Characters. To (1) use present Tennessee lines to add softness and other desirable milling qualities--earliness of maturity, short and stiff straw, smooth or awnless heads, resistance to black chaff, scab, and take-all; (2) incorporate resistance to Hessian fly; (3) select for feed and pasture types in crosses; and (4) test soft wheats for disease resistance in addition to those now available.

Pl. Path. 136 Coop. ARS



Tenn.

Corn Improvement. (1) Develop superior inbred lines, resistant to disease, insect pests, and of high quality. (2) Produce superior single and double cross hybrid combinations from these and other inbred lines. (3) Learn influence of cultural practices on yield and quality of corn, with reference to production and maintenance of quality seed stocks. (4) Study methodology of breeding, including research in genetics and physiology. (5) In cooperation with other departments and agencies, study diseases and insects of corn and control methods. (6) Investigate crop qualities with reference to yield and value.

Agron. 34 Coop. ARS

Tex.

Studies of Hybrid Sorghum Seed Production. To devise a practical method or methods of producing hybrid seed of sorghum in commercial quantities.

Agron. 610 Coop. ARS

Tex.

Investigations of the Biology and Control of Greenbugs, Spider Mites and Other Insects Attacking Small Grains. Learn occurrence, distribution, seasonal history, host plants, and their relationships, the influence of farm practices and environmental factors on greenbug and other aphids; several species of spider mites and other insects attacking small grains. Search for plant resistance to attack by greenbugs, mites, or other insects. Incorporate resistance to greenbugs available in certain Oriental barley varieties and in a selection of Dickinson wheat into varieties of barley and wheat adapted to Texas conditions. When better resistance is found, incorporate this into breeding program. Study basis and causes of resistance. Determine effectiveness under field and laboratory conditions of commercial and experimental insecticides on control of said insects.

Ent., Agron. 1020 Coop. ARS

Tex.

Oat Improvement. To (1) develop or discover new varieties of oats superior to present varieties and adapted to producing grain, forage or a combination of the two from fall or spring seeding, (2) study cold resistance or tolerance of varieties and strains, cooperate in testing hardiness of introduced strains and study nature of winter hardiness in oats, (3) develop oat varieties resistant to crown rust, stem rust and Helmintho-sporium blight, etc., (4) study forage and feed quality characteristics of oat varieties and strains under several environmental conditions and develop varieties especially adapted for grain, winter pasture, hay or oat silage, (5) cooperate with Department of Entomology in search for oat germ plasm resistant to greenbugs, etc., (6) cooperate in regional trials of yield, disease and insect resistance and winter hardiness and development of multiple factor genetic stock and (7) conduct research to increase knowledge of practical problems of the crop, study wild and cultivated species related to common oats for characteristics of value.

Agron., Pl. Physiol. and Path. 1027 Coop. ARS

Tex.

Barley Improvement. To (1) develop or discover new varieties of barley superior to present varieties and adapted to production of grain, forage or as combination of the two (2) incorporate into adapted varieties resistance to greenbugs from Omugi and other oriental varieties (3) to continue to search for resistance to diseases attacking barley, such as mildew, smuts, leaf blotches, and false stripe, (4) develop varieties resistant to leaf and stem rust for central and southern parts of the state where over wintering of the diseases on barley may influence spread to wheat and barley farther north, (5) learn cold resistance or tolerance of varieties and new strains and recommend use of varieties by areas in accordance with know hardiness, (6) give attention to forage characteristics of barley varieties and new strains in developing varieties suited for fall and winter grazing, (7) cooperate in trials of yield, tests of disease resistance, insect resistance, hardiness and development of multiple factor genetic stocks of value in the breeding program, (8) investigate additional commercial uses for barley and (9) conduct research to increase understanding of practical problems of the crop.

Agron., Pl. Physiol., Path. 1029 Coop. ARS

Tex.

Wheat Improvement. (1) Develop new varieties of wheat superior to present varieties and adapted to production of grain and/or forage, in state or introduced variety. (2) Study development of varieties resistant to diseases prevalent in each area as leaf and stem rust, smuts, mildew, septoria, and root rots. Breeding and control studies of rusts will be coordinated with Project 983 and will include wheat grown for forage and grain. (3) Cooperate with Arlington College and regional quality laboratory of USDA to learn quality characteristics of new varieties and strains. Select best quality strains and learn means of measuring quality characteristics and evaluating strains. (4) Study forage characteristics of varieties and strains and develop varieties suited for winter pasture, hay, or other feed. "Spelt" (non-threshing type) for feed and forage in South Texas will be studied. (5) Learn cold resistance of strains for release. (6)(7) Cooperate with entomologist in search for resistant germ plasm to greenbug attacks, etc. and with states and USDA in regional trials of yield, disease and insect resistance, winter hardiness and development of multiple factor genetic stocks.

Agron., Pl. Physiol., Path. 1033 Coop. ARS

Va.

Development and Selection of Adapted Corn Inbreds and Hybrids. To (1) develop and maintain a source of superior germ plasm (inbred lines) adapted to Virginia conditions by inbreeding open-pollinated varieties, combinations of inbred lines, and/or combinations of open-pollinated varieties with inbred lines; (2) develop by combining inbreds developed by the Virginia Agricultural Experiment Station and other experiment stations hybrids which are adapted to growing conditions in Virginia and adapted to planting methods found to be most advantageous; (3) thoroughly test experimental corn hybrids developed by the Virginia Station and others obtained from other experiment Stations with respect to adaptation to Virginia conditions; (4) cooperate with other experiment stations and make available to them seed of any inbred lines or hybrids which have been developed under this project and which they might find of value; and (5) to study and establish relationships that may exist between physical and genetic characteristics of inbred lines and their crosses.

Agron., Pl. Path. 86041



Va.           Control of Subterranean Insects Affecting Seedling Corn.  
To learn (1) efficiency of following procedures: a treating seed with an insecticide prior to planting; b insecticides in granulated form or as sprays applied in row; c insecticide-fungicide combinations as seed treatments, (2) effects by observation of more promising soil insecticides and seed protectants on seed germination and plant growth, (3) effect upon final yields of corn obtained from controlling said insects.  
Ent., Agron. 86065

W. Va.       Corn Genetics and Breeding. I. Corn Genetics. II. Corn Breeding. I. To study (1) mode of attack, (2) chromosomal translocations with reference to linkage in chromosome 5 and (3) crossing over in chromosome 1 in a special translocation stock. II. To study (1) production of superior hybrids of dent corn adapted to West Virginia, (2) production of yellow seeded varieties of Woodburn White Dent and (3) production of strains of sweet corn adapted particularly to the Point Pleasant area with high quality, uniformity, earliness and resistance to disease and earworm damage characteristics.  
Agron., Pl. Path. Gen. 29

Wis.       Host Plant Resistance to the European Corn Borer. To learn (1) factors affecting survival and establishment of European corn borer larvae on corn plants, (2) relative importance of factors in varietal differences in susceptibility to corn borer.  
Ent., Field Crops 958

Wyo.       Biology and Control of Small Grain Arthropods. Learn arthropods present in small grains, their damage, bionomics, control and distribution; and bionomics and control for wheat curl mite.  
Ent., Parasitol., Agron. 594

### III. Fiber and Oil Crop Insects

Ala.       Identification and Evaluation of Some of the More Common Factors Limiting Cotton Yields in Alabama. Determine (1) effect of moisture on cotton yields, disease, insects, and morphological characters in cotton; (2) interrelationship of N levels, insects, and disease on production; (3) relationship between cultural practices, soil physical properties, insect and disease control measures, and vegetative growth and yield of cotton plant; (4) average maximum yield obtainable without supplemental irrigation in various regions of state.  
Agron., Soils 113 Coop. ARS

Ala.           Control of Cotton Insects. To determine effectiveness of new insecticides against the boll weevil and other cotton insects and the effect of controlling various species upon the yield of cotton and to develop a dusting schedule for the control of the major insects attacking cotton.

Zool., Ent. 512

Ariz.           Breeding Cotton for Disease and Insect Resistance and for Plant Types Suitable for Mechanical Harvesting. To (1) evaluate resistance of present breeding stocks to local diseases and insects and ability for mechanical harvesting, (2) introduce stocks from other localities having similar problems, (3) cooperate in production of high yielding varieties of good spinning quality suitable for mechanical harvesting and (4) provide adequate initial seed stocks of desirable strains for distribution to growers.

Pl. Brdg., Pl. Path. 278 (S-1) Coop. ARS

Ariz.           The Biology and Control of Insects Affecting Cotton in Arizona. (1) Ecological Studies of Cotton Insects. a The more important pests should be studied in relation to their places of origin, if waste land, ditch banks, cultivated field, etc. b Occurrence of parasitic and predator insects should be studied to learn which species are present in significant numbers in Arizona, which species are effective against which pest, which control methods and environmental factors favor or restrict their effectiveness. c Information is needed regarding pest fluctuation in relation to control practices. (2) Life History Studies. Information is needed concerning spider mites, thrips, aphids, darkling beetles, cotton leaf perforator, cotton "leaf-roller". (3) Chemical Control Studies. Toxicological Studies, Residue Deposit Studies, Test of New Compounds. (4) Miscellaneous Studies. Existing information dealing with Arizona cotton insects would be assembled and with cooperation of USDA Entomologists information would be issued. Field infestations of said pests, populations of beneficial insects and presence of actual plant injury would be studied. Types of possible insect injury to marketed product should be investigated.

Ent. 383 Coop. ARS

Ark.           Improvement of Insecticidal Control of Cotton Insects. (1) Develop better timing of insecticidal applications in relation to infestations, weather, and agronomic practices. (2) Learn feeding habits and methods of exposure of weevil to insecticides. (3) Develop alternative insecticides and control methods for weevils and aphids. (4) Study off-season habits and activities of cotton insects in relation to outbreaks on cotton. (5) Evaluate predator populations and factors affecting them.

Ent. 333

- Ark.            Ecology and Control of Pink Bollworm. To (1) learn probable future importance of the pink bollworm as a pest of cotton, and (2) develop satisfactory control measures applicable to Arkansas agricultural practices and climatic conditions.  
Ent. 367 Coop. ARS
- Ark.            Pink Bollworm Control in Arkansas. (1) Learn probable future importance of pink bollworm as a pest of cotton in State. (2) Develop control measures applicable to State agricultural practices and climatic conditions.  
Ent. 453 (S-37) Coop. ARS
- Ark.            Biological and Physiological Factors in Relation to Boll Weevil Abundance and Control. To (1) study activity of boll weevil and relate this activity to selection of particular cotton fields or plant types and to insecticidal and cultural control methods, (2) evaluate earlier biological studies in relation to present control practices, (3) study effect of physical characteristics of plant on activity, (4) study effect of physical environment and feed on longevity, fecundity, appearance and development of diapause and relate this information to improvement of control methods.  
Ent. 461
- Ga.            Cotton Breeding. To develop (1) a high yielding cotton with a staple of 1 inch or longer which is wilt resistant and (2) new strains or varieties having superior qualities of disease and insect resistance, earliness, and yielding ability combined with special foliage branching, and picking qualities needed to meet the requirements of mechanized farming.  
Agron. 26 Coop. ARS
- Ga.            Cotton Insect Control with Improved Insecticides Under North Georgia Conditions. To determine value of various insecticides for control of cotton insects, especially the boll weevil, and to determine most profitable schedule for applications.  
Ent., Agron. 67
- La.            A Study of Insects, Mites and Nematodes Destructive to Cotton and the Development of Economical Means for Controlling Them. To study insects, mites, and nematodes which infest cotton, determine economic importance of the pests, and develop satisfactory and economical methods of control.  
Ent. 465 Coop. ARS



- La.                    To Conduct Studies on the Ecological Factors Responsible for Destructive Outbreaks of Cotton Insects.  
To obtain information on ecological factors responsible for destructive outbreaks of cotton insects and to develop methods for accurately forecasting such outbreaks.  
Ent. 606 Coop. ARS
- La.                    To Study Those Factors Which Affect Cotton Fiber Quality. To learn (1) fiber length, length uniformity, fineness and strength of fibers of varieties and advanced strains; (2) effects of different methods of harvesting cotton on fiber length, length uniformity, fineness and strength of fibers; (3) effect of certain insects, spider mite, and nematode infestations, upon fibers.  
Agron., Ent., Home Econ. 895
- La.                    Breeding Cotton for Resistance to Major Diseases and Insects. (1) Develop new varieties having combined resistance to rootknot nematodes and Fusarium wilt. (2) Evaluate commercial varieties of cotton recently released by Agricultural Experiment Stations and private companies for resistance to major cotton diseases found in State, (3) Screen genetically divergent types of cotton for resistance to boll weevil, boll-worm, aphids, spider mites, Fusarium wilt, rootknot nematodes, seedling disease due to Rhizoctonia and boll rot to be used in breeding new varieties with resistance to these pests and diseases.  
Agron. 949 Coop. ARS
- Miss.                  A Study of Thrips on Cotton. Learn (1) economic importance of thrips, (2) effect of existing control recommendations on fruiting cycle; start of blooming, rate of blooming, length of blooming period, rate of setting of fruit, length of fruiting period; (3) varietal differences and their effect on fruiting with relation to thrip injury; (4) interrelation of thrips infestation on cotton to that on other host plants; (5) (Conditional objective) economic importance of thrips in relation to actual potential production and in relation to control of other cotton pests.  
Ent., Agron HH-12

Miss.

Inheritance Studies Concerning Yield, Fiber Properties, and Disease and Insect Resistance in Upland Cotton. To (1) classify and isolate as far as possible factors which affect yield, fiber properties, and disease and insect resistance, (2) determine when possible genetic ratios expressed by simply inherited factors and number of factors involved where inheritance is more complex; and (3) determine at what stage in cotton development, specific factors are operating to produce end results observed.

Agron. RRFU-1-c (S-1) Coop. ARS

Miss.

Improvement of Methods and Equipment for Growing Cotton. To (1) determine efficiency of different types of stalk shredders and improve machines for stalk disposal, (2) evaluate methods of seedbed preparation and learn effect of different methods of preparation on stand, weed control and crop yield, (3) learn effects of several deep tillage methods on hardpan soils of the Yazoo-Mississippi Delta, (4) learn effect of different openers and planting methods on stand and yield with special reference to improved seed germination and stands in heavy clay soils of the Yazoo-Mississippi Delta, (5) test, evaluate, and improve new or experimental equipment for field application of both liquid and granular fertilizers, (6) design, test, evaluate, and improve machines and techniques for the application of both pre- and post-emergence herbicides, (7) test, modify and improve mechanical methods of weed control, including flame cultivation equipment, and (8) evaluate and improve machines and methods for controlling cotton insects with particular emphasis on efficiency of application and adaptability of equipment for multiple uses.

Engin., Agron. RRFU-2-a (S-2) Coop. ARS

Mo.

Insects of Cotton in the Cotton Growing Section of Missouri. To become familiar with the biology and habits of major insect pests of cotton in the cotton section of Missouri; to evaluate their importance; determine the insect pest population levels which justify use of control measures; and work out effective controls.

Ent. 214

N. Mex.

The Occurrence of Beneficial Insects as Related to Insecticidal Control Programs for Hemipterous Insect Pests of Cotton. To determine (1) occurrence and abundance of beneficial insects in cotton fields; (2) relative importance of species found in terms of predatory or parasitic preference for hemipterous insects injurious to cotton, and (3) effect of chlorinated hydrocarbon type insecticides on beneficial insects when applied as control of harmful hemipterous species.

Biol., Ent. 54

N. C.

The Control of Cotton Insects in North Carolina. To (1) determine through field experiments, best available chemical and cultural control for important cotton insects, including boll weevil, boll worms, thrips, mites and aphids; (2) Conduct laboratory screening tests on these pests using new candidate insecticides to find new and better materials for control; (3) study possible correlation between climatic conditions and cotton pest incidence; and (4) determine effects of insecticide residues occurring in the soil as a result of chemical control of cotton insects on crops subsequently grown on same land.

Ent. 43

N. C.

An Analysis of Preference Exhibited by Boll Weevils for Certain Varietal Characteristics of Cotton, and an Evaluation of the Possibility of Breeding for Resistance to Boll Weevil (Anthonomus Grandis Boh). (1) Assemble a collection of simply inherited, morphological and physiological variants in cotton deterrent to boll weevil. (2) Test if weevils exhibit preferences when offered choice of hosts in replicated tests. (3) Combine into 1 strain all variant physiological and morphological characteristics weevil has exhibited a negative preference for. (4) Learn if true resistance can be built up from combination of negative preferences. (5) Study nature of any preferences established. (6) Study magnitude and nature of any harmful effects on fiber or yield associated with variants of investigation. (7) Evaluate possibility of introducing an economic degree of weevil resistance into cotton by genetic means.

Gen. 73

S. C.

Causes of Non-Fluffed Locks in Cotton and Their Effect on Yield, Quality, Mechanical Harvesting and Ginning. Learn (1) influence of insects and insecticides; fungi and bacteria; defoliants and defoliation; soil temperature, atmospheric temperature, and soil moisture on occurrence of non-fluffed locks; (2) influence of non-fluffed locks on mechanical picker performance; ginning; lint fiber qualities; seed quality and germination; yield of seed cotton, seed and lint.

Agr. Engin. 395 Coop. ARS



Tenn.

A Study of the Life History and Means of Control of Insects that Affect the Growth of Cotton. To determine the harm done to the cotton plant in early stages of growth by thrips, flea beetles, root lice, plant bugs, and, in some years, boll weevil.

Ent. 98

Tex.

The Interrelations and Control of Insects Attacking Legumes and Cotton. To (1) determine effect of insect populations developed on legumes grown for seed and soil improvement upon abundance of injurious insects in cotton; (2) develop or discover cultural methods to control or modify insect injury to cotton from use of legumes for seed production and soil improvement; (3) determine relation of over-wintering and abundance of thrips, spider mites, fleahoppers and aphids on wild winter and spring host plants in permanent and improved pastures and fence rows, roadsides, etc., to migration and abundance in seedling cotton; and (4) develop most economical control for these insects.

Ent., Agr. Engin., Agron. 557 Coop. ARS

Tex.

Genetics and Improvement of Cotton. To establish sound principles and practices for improvement of cotton through basic research in cytology and genetics by: (1) maintenance of the Gossypium species, interspecific hybrids and geographic races of Gossypium hirsutum, (2) cytogenetic studies on nature of species differences, and barriers, (3) cytogenetic investigations on effects of individual chromosomes within species and in derivatives of species hybrids, (4) development of marked stocks as an aid in cytological and genetical analysis, (5) evaluation of interspecific hybrids, polyploids, and primitive and foreign stocks with respect to their potentialities as sources of characters of economic importance, (6) genetic analysis of desirable characters in interspecific hybrids and in stocks derived from them, and (7) development of primary stocks which possess useful characters, or combinations thereof, not found in American Upland cotton.

Agron. 600 (S-1) Coop. ARS

Tex.            Spraying Equipment for the Control of Cotton Insects and for Defoliation. To (1) improve spraying equipment in efforts to obtain better distribution of chemicals for control of pink bollworm; (2) determine nozzle type, arrangement and spacing to give optimum spray patterns for insect control including pink bollworm and for defoliation of cotton plants; and (3) check insect infestations to determine effectiveness of insecticidal applications with various types and arrangements of nozzles on booms and effects of chemical removal of foliage of cotton on full populations of insects, especially overwintering of pink bollworms in unharvested material.

Agr. Engin., Ent. 722

Tex.            The Relationship Among Insects, Insecticides, Weather and Host Plants in the Control of Field Crop Pests, with Special Reference to Cotton. To determine (1) effect of wind, rain, temperature, light, humidity, and dew, under controlled conditions individually and in combination, on the toxicity of various insecticides to specific insect pests; (2) effect of age, size and condition of growth of host plant on the toxicity of insecticides to plant pests; (3) speed of action of various insecticides to certain pests; and (4) effect of dosages and single and multiple applications on residual toxicity of insecticides.

Ent. 933    Coop. ARS

Tex.            Treatment Schedules for Control of Insects Attacking Cotton. To determine most economical schedules of insecticidal applications for control of cotton insects.

Ent. 934    Coop. ARS

Tex.            Flax Improvement. To (1) develop or discover new varieties of flax better suited to Texas than now available, (2) search for greater cold resistance among imported or domestic strains and hybrid material, (3) cooperate in testing domestic and imported strains for sources of disease resistance, cold resistance and agronomic characteristics of value in the program, (4) test rate and date of seeding, fertilizer needs of crop and cultural methods for flax, (5) cooperate in control tests of nematodes and insects which attack flax.

Agron., Pl. Physiol., Path. 1028    Coop. ARS

- Tex.            Chemical and Biotic Control of the Pink Bollworm.  
(1) Develop effective controls and coordinate these with control of other cotton insect pests. (2) Evaluate and learn nature of biotic action in cotton types exhibiting resistance or tolerance.  
Ent., Agr. Engin., Agron. 1094 (S-37) Coop. ARS

#### IV. Insects of Grasses and Legumes

- Ala.            Breeding of Sericea Lespedeza, Crimson Clover and Vetch. To (1) develop improved variety of sericea that is more palatable, more nutritious, disease-resistant and higher yielding; (2) develop higher yielding, more disease-resistant, non-shattering hard-seeded variety of crimson clover producing earlier fall grazing; (3) develop vetch capable of producing high yields of green matter and seed; and (4) determine which varieties of certain legumes now available are best adapted as green manure crops for general use in the state.  
Agron., Soils 404
- Ala.            Control of Insect Pests of Legumes. Studies will be made to determine the species of insects attacking vetch, Austrian winter peas, blue lupine, Caley peas, alfalfa, serecia, and other legumes in Alabama. Periodic examinations will be made to determine the presence of insects, and population counts of injurious forms will be made and estimates of damage recorded. Special attention will be given to insects affecting seed production. Small replicated field plots will be dusted with promising insecticides, infestation counts of insects made, and yield records taken. In storage, insecticidal dusts and fumigants will be tested for efficiency and suitability in protecting seed from damage.  
Zool., Ent. 513
- Ariz.            Insects and Mites Affecting Alfalfa in Arizona. To study insects and mites found on alfalfa in Arizona, as to (1) biology and ecology of injurious insects as aid to developing improved control methods; (2) biology and ecology of injurious mites as aid to developing improved control methods; (3) beneficial insects and factors which favor their activity; (4) investigations of chemical and non-chemical control methods; (5) investigations of insecticide residues on alfalfa and problems resulting therefrom.  
Ent. 322 Coop. ARS



Ariz.

Insect Parasites in Relation to Producing Chalcid Injury to Alfalfa Seed Crops. Learn (1) identity, nature, and effectiveness of natural enemies of clover seed chalcid occurring in irrigated seed alfalfa fields; (2) the more important environmental conditions favoring or restricting activity of chalcid and its natural enemies; emphasize effect on yield and quality of alfalfa seed. (3) Study feasibility of minimizing chalcid damage to alfalfa seed crops by using practices to restrict chalcid activity or stimulate activity of natural enemies.  
Ent. 445 (W-43)

Ark.

Ecology and Control of the Spotted Alfalfa Aphid.  
(1) Learn causes of outbreaks and evaluate factors effecting duration and intensity of outbreaks and evaluate effect of cultural practices on populations of aphids and their natural enemies. (2) Improve biological control by release of parasites and other agents, and develop cheap and effective insecticidal controls. (3) Evaluate resistance and susceptibility to aphids of alfalfa varieties and breeding material, and locate resistant plants for use as breeding material.  
Ent. 452 (S-25)

Ark.

Biology and Control of Three-Cornered Alfalfa Hopper.  
(1) Study life cycle and seasonal history of insect; learn factors affecting its abundance, and evaluate its capacity for damage. (2) Study direct and indirect methods of control.  
Ent. 454 (S-25) Coop. U. S. Natl. Museum

Calif.

Alfalfa Improvement Including Breeding, Production and Management Practices. (1) Develop by breeding methods, strains of alfalfa resistant to: bacterial wilt, dwarf disease, leaf diseases, root and crown rotting organisms, aphids, and nematodes; improve quality and yield of alfalfa by breeding; develop basic data on genetics and cytogenetics of alfalfa; develop basic data on fundamental nature of resistance to certain disease and insects; and evaluate new alfalfa varieties for forage. (2) To improve management practices to obtain highest possible production of total digestible nutrients per acre, study: time of cutting, curing process, water management, fertilization, weed and pest control, harvesting practices and equipment, and varietal relationship to management practices. (3) Study to improve management practices to obtain highest possible production of high quality seed by investigating: condition of stand, water management, pollination problems, weed and pest control, plant population studies regarding seed production, evaluation of varieties for yield, and effect of production practices on quality.

Agron 972 Coop. ARS

Calif.

Breeding Alfalfa Adapted to Desert Valley Areas of Southwestern United States with Special Emphasis on Resistance to Spotted Alfalfa Aphid (*Therioaphis Maculata*). Develop a variety of alfalfa of superior yield and adaptation to desert valleys of southwest by (1) breeding for resistance to yellow clover aphid, (2) continuing and expanding work on tolerance to *Rhizoctonia* crown and root rot, (3) breeding for increased winter growth habit, (4) breeding for tolerance to alkali and high water table conditions, (5) breeding for lodging resistance.

Forage Crops, Ent., Pl. Path. 1646 Coop. ARS

Calif.

The Assessment and Nature of the Injury Caused by the Spotted Alfalfa Aphid. (1) Learn extent and in what manner the spotted aphid affects the yield and quality of alfalfa. (2) Use this data in assessing damage caused by spotted alfalfa aphid and the necessity for control procedures.

Ent., Parasitol. 1721 (W-43)

Calif.

The Ecology, Biology and Control of Insects and Mites Affecting the Seed Production of Alfalfa, Clover, and Other Small Seeded Legumes in Northern California.

(1) Obtain additional information on biology of pests affecting seed production of alfalfa, Ladino clover, red clover, and other small-seeded legumes. (2) Learn manner and extent to which seed yield and quality are influenced by abundance and activity of pests. (3) Study problems of insecticide resistance in lygus bugs and mites. (4) Develop economical controls for these pests.

Ent., Parasitol. 1735

Conn.

The Biology and Control of Root Feeding Weevils of the Genus Sitona on Alfalfa. To learn (1-4) extent of injury to alfalfa caused by Sitona weevils; life history, seasonal history, habits, occurrence, and distribution under local conditions; relationship and influence of ecological factors to these insects, their abundance and injury; parasite and predator complex associated with weevils and effect of insecticide treatments upon these forms. (5) Develop an effective control program. (6) Effect of control program on subsequent productivity and persistence of alfalfa.

Ent. 311

Fla.

Improvement of Lupines by Breeding for Yield and Insect and Disease Resistance. To develop improved varieties of lupines adapted to Florida conditions.

Pl. Path., Agron. 612

Ga.

Biology and Control of Insect Pests of Grain Sorghum. (1) Learn important insect pests of grain sorghum. (2) Develop insecticidal and cultural control measures. (3) Study biological and ecological aspects of economic grain sorghum insects.

Ent. 69

Idaho

The Relationship of Insect Activity to the Establishment and Decline of Alfalfa and Clover Stands. Learn (1) insects directly affecting establishment of alfalfa and clover stands; (2) how their activity relates to establishment and decline; (3) their life histories and habits and ecological factors influencing their activity and development.

Ent. 330



- Ind.            Alfalfa Improvement Through Selection and Breeding.  
To develop by breeding and selection high yielding, disease  
and insect resistant varieties of alfalfa of high  
nutritional quality well adapted to environmental  
conditions of Indiana.  
For., Pl. Path., Ent. Agron. 245
- Ind.            The Effects of Insects, Insecticides, and Cultural  
Practices on the Quality and Quantity of Forage and Seed  
Yields of Alfalfa. To study (1) effects of new insecticides  
on insect populations and on alfalfa plant yields and  
quality; (2) seed production as influenced by various  
cultural methods as seeding, overhead irrigation, and  
blooming dates as influenced by time of cutting; and  
(3) pollinators as affected by chemicals to control  
injurious insects and determine time that most beneficial  
pollinators are at a maximum so that alfalfa crop can be  
planned to coincide with the period.  
Agron., Ent. 510
- Kans.           The Effects of Different Systems of Management of  
Grasslands and Conservation Areas Upon the Insects Injurious  
to Grasses. To determine cause and extent of insect injuries,  
study relationship between grassland insects and insect  
injuries to adjoining crops, study life histories, habits  
and control of grassland pests, and observe grass species  
and selections for differential insect injury.  
Ent. 211 Coop. SCS, ARS
- Kans.           Insects Affecting Alfalfa Hay and Seed Production. To  
(1) determine (a) the value of newer insecticides for control  
of plant bugs and other injurious insects, (b) effect of  
these insecticides on alfalfa seed and hay production,  
(c) effect upon alfalfa pollinating insects, and (d) species  
concerned with pollination of alfalfa by insects and rate of  
tripping of each; and (2) devise (a) methods of increasing  
numbers of honeybees and solitary bees per square yard in  
alfalfa fields, and (b) controls for insects which live on  
alfalfa seed while seed is in storage.  
Ent. 263 Coop. ARS

- Kans.            Control of Insects Injurious to Alfalfa and Allied Plants. To (1) study all of the insects which obtain their living primarily or secondarily from alfalfa or allied plants; (2) test old and new control measures for all those species which cause commercial damage; (3) study annual fluctuations of more important species in an effort to understand the causes of abnormally large or small population; and (4) determine effects of high temperatures in the field and the effects of cutting on populations of alfalfa insects.  
Ent. 409
- Kans.            Developing and Testing Pasture-Type Alfalfas.  
(1) Evaluate various alfalfas, including foreign introductions, as to their ability to persist and survive under the extreme climatic and management practices that prevail on the range. (2) Develop, from the best strains, through selection and breeding, adapted high yielding, disease- and insect-resistant varieties. (3) Study the behavior of pasture-type alfalfas under different management practices and soil and climatic conditions. (4) Conduct uniform variety yield trials involving pasture types.  
Agron. 473    Coop. ARS
- Ky.              Seed Production in Red Clover and Alfalfa. To determine (1) effects of different cultural and fertilizing practices and of insect control measures upon seed yield and quality, (2) amounts and causes of seed losses in harvesting, (3) isolation necessary to prevent significant crossing of varieties, and (4) degree of loss in crop adaptation occurring in successive seed generations produced under farm conditions.  
Agron. 162    Coop. ARS
- Ky.              Control of Aphids on Clover and Alfalfa. To find a satisfactory remedy for this pest through agronomic practices or through the use of insecticides which will not leave an objectionable residue.  
Bot., Ent. 461

Ky.           The Ecology and Control of Leafhoppers on Alfalfa and Clover. To (1) evaluate damage done by this pest as to areas involved, crop rotation practices used and climatological aspects; (2) determine species of leafhoppers involved, (3) study clover or alfalfa varieties in connection with leafhopper population studies; and (4) find practical control measures.  
Ent., Bot. 462

Ky.           Studies on the Ecology and Control of the Clover Leaf Weevil, (*Hypera Punctata* Fab.) To (1) evaluate the areas infested with reference to crop rotation practices; (2) study factors involving weather as it affects population development; (3) conduct investigations on biological control phase of the insect; and (4) evaluate various chemicals that offer promise in control efforts.  
Ent., Bot. 463

La.           Soybean Breeding. To develop varieties of soybeans which are particularly well adapted for the production of seed, forage and soil improvement under varying soil and climatic conditions in Louisiana.  
Crops, Soils 134 Coop. ARS

La.           Investigations of Insects Which are Destructive to Leguminous Forage and Cover Crops. To study the insects which infest forage and soil improving crops including (1) population and importance of the different types, (2) biology and natural enemies, (3) host crops and wild plants with seasonal preferences, and (4) chemical control.  
Ent. 412

Md.           Weed Control in Legumes. To (1) further evaluate selective herbicides that may be used for control of various weeds in legumes; (2) study importance of fertilizer rates and placement and seed rates and placement in establishment of legumes with a minimum of weed competition; and (3) study interrelation of alfalfa varieties, rate of fertilization, use of chemical herbicides, and insect control practices.  
Agron. B-58-c

Minn.        Insects Affecting Alfalfa And Clover Seed Production.  
1. Destructive Insects. 2. Beneficial Insects. To study life histories and ecology of destructive insects with a view toward devising satisfactory methods of control; and to study life histories and ecology of beneficial insects with a view toward increasing their abundance and efficiency.  
Ent., Econ. Zool. 1723



- Minn.      Studies on the Attractiveness of Alfalfa Clones to Pollinating Insects. To contribute to better pollination of alfalfa by (1) evaluating attractiveness of alfalfa clones to different species of pollinating insects; (2) determining factors that affect attractiveness of alfalfa flowers to pollinators, and (3) using this information to explore possibilities of developing alfalfa varieties more attractive to pollinating insects.  
Agron., Pl. Gen., Ent., Zool. 1724
- Mo.      The Spotted Alfalfa Aphid. (1) Study its biology and ecology under State conditions, (2) Learn nature and extent of its damage to alfalfa under State conditions. (3) Develop control measures, including more effective insecticides, value of flaming and cultural methods, and use of biological agents.  
Ent. 309
- Nebr.      Sweetclover Weevil Investigations. To (1) improve quality of sweetclover forage through development of varieties resistant or tolerant to attack by sweetclover weevils; (2) investigate diseases of sweetclover weevil and effect of these diseases on sweetclover weevil populations; and (3) study biology and ecology of sweetclover weevil, and if suitable conditions appear, to test some of the newer insecticides under Nebraska conditions.  
Ent., Agron 489 Coop. ARS
- Nebr.      The Biology, Ecology and Control of the Spotted Alfalfa Aphid (*Pterocallidium* Sp.). Study (1) biology and ecology of spotted alfalfa aphid; (2) effects of plants grown in nutrient solutions on aphid development and honeydew secretion. (3) Learn the nature and extent of damage to alfalfa by alfalfa and pea aphids under various growing conditions. (4) Search for resistant varieties. (5) Develop control measures.  
Ent., Agron 521 Coop. ARS
- Nev.      Breeding Alfalfa for Resistance to the Spotted Alfalfa Aphid. (1) Learn relative resistance of commonly used varieties of alfalfa to spotted alfalfa aphid. (2) Evaluate new varieties, synthetics, and introductions for resistance to spotted alfalfa aphid. (3) Learn mode of inheritance of resistance to aphid. (4) Develop varieties resistant to spotted alfalfa aphid and otherwise adapted to intended areas.  
S. Nev. Fld. Sta. Agron. 39 (W-40) Coop. ARS  
(Also see Part 10, Nevada)

- N. J.            Life History, Ecology and Control of the Alfalfa Weevil, *Hypera Postica*, in New Jersey. Learn ways to control alfalfa weevil under New Jersey conditions.  
Ent., Zool. 185
- Okla.           Breeding to Improve Native and Exotic Pasture Legumes.  
To (1) assemble varieties and strains of native and exotic legumes in observation nurseries for preliminary screening on basis of adaptation and performance; and (2) produce new and superior varieties, using best available material for better adaptation, seed and forage yields, quality or disease resistance.  
Agron. 767 (S-12) Coop. ARS
- Okla.           Control of Insects Injurious to Forage Legumes.  
(1) Evaluate chemical, biological, and cultural control agents and techniques as a means of reducing severity of arthropod attack. (2) Learn effects of beneficial and injurious arthropods on seed, hay, and pasture production of forage legumes. Study (3) taxonomy, biology and ecology of arthropods associated with legumes to insure effectiveness of chemical control measures; (4) resistance to control agents exhibited by arthropods and resistance to arthropods exhibited by legumes. (5) Learn insecticidal residues at intervals following treatment both chemically and by bioassay.  
Ent. 991
- Pa.             Insect Pests of Forage Crops. To (1) investigate physical and biotic factors influencing population levels of insect pests associated with forage crops production (red clover and alfalfa), (2) develop and compare control methods, (3) learn influence of given control procedures on seasonal population levels of major pest species, and (4) investigate residual effects of insecticides on subsequent crops grown in same soil and on insect populations associated with these crops.  
Zool., Ent. 1241
- S. Dak.        The Breeding and Testing of Superior Grasses Adapted to South Dakota. To originate by breeding and selection, strains of grasses adapted to South Dakota conditions. To introduce and determine the adaptability of strains and species of grasses for the different agricultural areas of the state. To determine the palatability and nutritive value of superior strains. To cooperate with institutions in neighboring states by exchanging of ideas and materials. To pursue studies calculated to increase fundamental knowledge relating to the breeding of grasses.  
Agron. 182

- S. Dak.      Investigations of the Alfalfa Insect Situation in South Dakota. To learn (1) type and degree of damage of most prevalent insect pests of alfalfa in state, (2) best methods of controlling pests under state conditions, (3) economic value of native pollinating insects in state to pollination of alfalfa grown for seed, (4) best method of placing colonies of honey bees in alfalfa fields to increase seed production.  
Ent., Zool., Agron. 288
- S. Dak.      Investigations of the Spotted Alfalfa Aphids in South Dakota. (1) Study biology and ecology of aphids under State conditions. (2) Cooperate with plant breeders in search for sources of resistance and in the incorporation of such resistance into varieties adapted to several states (emphasis on adapted varieties for northern plains). (3) Learn insecticidal controls adapted for protection of seedling alfalfa.  
Ent., Zool., Agron. 311
- Tenn.      A Study of the Insects Attacking Legumes, with Special Reference to Alfalfa and Soybeans. To get a better understanding of insect populations on soybeans and alfalfa, and their relative importance on yields.  
Ent. 96
- Tex.      Evaluation and Improvement of Legumes. To (1) collect native and introduced legumes in conjunction with RM State Project 717, and determine their adaptation to the various climatic and soil conditions of the state; (2) select plants or strains possessing combinations of desired characteristics, such as forage and seed yield, forage quality, palatability, stand longevity, resistance to diseases, insects and drouth, ability to grow successfully with other species, winter hardiness, seasonal growth, and vigor of recovery after defoliation; (3) study response of legumes to different fertility levels; (4) combine by breeding methods into a single plant or strain as many superior traits as possible; (5) study factors that may aid in increasing seed production; and (6) conduct extensive strain tests with improved material and increase foundation seed in accordance with objective No. 2.  
Agron. 460 (S-12) Coop. ARS



Tex.        The Biology and Control of Insects and Mites Attacking Legume Crops. To (1) determine injurious species of insects or mites attacking legumes; (2) determine biology and control of injurious species; and (3) develop controls for soil insects attacking legumes or the crops following legumes.

Ent. 929 (S-25)

Utah        Activity of the Clover Seed Chalcid in Relation to Alfalfa Varieties and Current Cultural Practices. Learn (1) extent of differences in susceptibility of standard alfalfa varieties to injury by clover seed chalcid; (2) value of cultural control measures developed about 40 years ago, and reconsider them in light of increased knowledge and existing cultural practices; (3) effect of various insecticide treatments used for control of other insects, on seed chalcid and its natural enemies. (4) Study biology of clover seed chalcid and its natural enemies with reference to above objectives with special reference to objectives 1 - 3.

Zool., Ent., Agron. 480 (W-43) Coop. ARS

Va.        Control of the Southern Corn Rootworm Attacking Peanuts. To obtain information on: (1) insecticidal effectiveness of new compounds and decreased concentrations of those now recommended; (2) insecticidal effectiveness of new formulations; (3) efficiency of insecticide-fertilizer mixtures compared to granulated and dust formulations; (4) insecticidal effectiveness of side dress applications compared with broadcast; (5) most effective application time; (6) effect of insecticide treatment on maturity of peanut crop; (7) soil persistence of insecticides for rootworm control; (8) amount of residue in peanuts after control measures; and (9) effect of palatability after control measures.

Ent. 86042

Va.        Bionomics and Control of the Clover Root Borer, Hylastinus Obscurus (Marsham), and Control of the Clover Root Curculio, Sitona Hispidula (F.). (1) Make further studies of life history and habits of clover root borer. (2) Study further chemical control measure; and explore possibility of varietal resistance to, or tolerance for, this insect in red clover. (3) Learn if life of red clover stands can be prolonged by controlling clover root borer. (4) Make further tests for control of clover root curculio. (5) Study other insect pests of clover and alfalfa as warranted.

Ent. 86061

Wash.

The Ecology of Insects and Mites on Alfalfa. To learn (1) reasons for increases in population of certain insects and mites on alfalfa following insecticide applications; (2) relationship among insect parasites and hosts, and insect and mite predators that prey on alfalfa under natural conditions and as affected by insecticides.  
Ent. 1283 (W-43)

W. Va.

Maintaining Profitable Stands of Alfalfa. To (1) evaluate soil conditions and disease and insect damage on established fields of alfalfa and relation to yield and longevity of stand; (2) determine effect of placement and amount of nutrient elements on establishment, yield, and longevity of alfalfa stands; and (3) determine effect of soil fungicides and insecticides on establishment, yields, and longevity of alfalfa stands.  
Agron., Pl. Path. 50

W. Va.

The Cause of and Remedy for Red Clover Failures in West Virginia. To (1) determine cause of failures of red clover hay and seed crops and devise remedies, and (2) investigate factors found primarily responsible for these crop failures.  
Pl. Path., Agron. 51 Coop. ARS

Wyo.

Economic Importance and Control of Alfalfa Insect Pests. Alfalfa Weevil. To (1) determine how many successive years of treatment with an approved insecticide are necessary to bring an infestation below economically injurious numbers; (2) determine how many years a controlled infestation will take to reach once again an economic level; and (3) compare the effectiveness of heptachlor and dieldrin as an alfalfa weevilcide. Army cutworm. To (1) determine the nature and extent of injury to alfalfa by army cutworms; and (2) find an insecticide or combination of insecticides that will control effectively and economically both alfalfa weevil and army cutworm. Pea aphid. To (1) determine the density of pea aphids in alfalfa throughout the season; and (2) determine the nature and extent of injury caused by the pea aphid to alfalfa.  
Ent., Parasitol. 565

- Wyo.            Evaluation of Insect Predators in Alfalfa. (1) Survey predaceous insects and their possible prey and follow populations through growing season. To learn (2-4) food preference of predators under normal and under starved conditions; numbers of prey eaten by predators; reactions of predators to variations in populations of prey and of other predators.  
Ent. 600 (W-43)
- Wyo.            Control of Clover Seed Chalcid. (1) Learn effectiveness of DDT, Toxaphene, and other insecticides for clover seed chalcid control when applied at various intervals.  
Ent. 623
- V.    Insects of Miscellaneous Forage Crops
- Calif.          Biology and Ecology of Rangeland Grasshoppers.  
(1) Make an intensive ecological study of a limited rangeland area inhabited by several of important rangeland grasshoppers. (2) On basis of study, analyze and evaluate roles of various ecological factors in population dynamics of rangeland grasshoppers in area. (3) Use information in helping better understand population dynamics of range grasshoppers, to predict grasshopper damage to rangelands, and to develop more effective and intelligent control measures.  
Ent. 1720 (W-37) Coop. ARS
- Ga.            The Evaluation of Insect Damage to Forage Crops and the Development of Control Methods. To study problems relating to insects of forage crops, used for pasture, hay, silage, soil conservation and improvement, and seed production of such crops by: (1) determining important insect pests and measuring amount of damage; (2) studying life cycles, habits, seasonal occurrence, and distribution; (3) studying relationship of such factors as biological control, use of insecticides, and cropping practices, to insect abundance or cause of outbreaks; and (4) developing efficient control measures when justified.  
Ent., Agron., Anim. Husb. 66 (S-25) Coop. ARS



- Ill.            Ecology and Control of Pasture and Meadow Insects. To develop insect control measures and practices that will promote more efficient use of land devoted to production of pasture and hay crops.  
Ent. 12-315
- Ky.            Insect Damage to Turf and Sod. To learn (1) damage by certain insects to turf and sod, and (2) control measure of insects.  
Ent., Agron., Bot. 459
- La.            Biology and Control of Insects and Mites Attacking Forage Crops. (1) Study biology and ecology of insects and mites injurious to forage in state. (2) Evaluate damage from standpoint of yield and quality of forage. (3) Develop economical and practical means of controlling these pests.  
Ent., Agron. 887 (S-25)
- Maine           Control of Forage Crop Insects. To determine pests of forage crops in Maine and effect of control measures on quality and yield of these crops.  
Agron., Ent. 67
- Mass.           Insects in Relation to Forage Crops in Massachusetts. To (1) gain a knowledge of insect pests of forage crops, their distribution, life histories, and importance, (2) control of insect pests attacking forage crops in Massachusetts, (3) consider the effects of insecticide applications on forage crops on beneficial insects as bees, (4) cooperate with other agencies in learning residues present on forage as result of insecticide application.  
Ent. 139
- Miss.           Insects and Mites Affecting Important Forage Crops. To (1) determine economic importance of insects and mites present in major forage crops, both subterranean and above ground; (2) make necessary biological studies to determine practical control measures; and (3) determine control measures, including cultural methods, biological controls and insecticidal controls.  
Ent. RRFH-1 (S-25)

- N. Mex.      Relation of Insects to Seed Production and Re-establishment of Range Grasses. To learn (1) influence of thrips on seed production of range grasses with emphasis on black grama, and (2) extent to which stand and yield factors of range grasses are affected by harvester and other ants.  
Bot., Ent. 75    Coop. ARS
- N. C.      Investigation of Insects Affecting Forage Crops in North Carolina. To study insects associated with peanuts, pasture and hay, soybeans, small grains and sorghum and to determine how to contend with those adversely affecting production of these crops.  
Ent. 46
- N. C.      The Development of High Yielding Varieties of Annual and Perennial Lespedeza with Improved Quality of Forage, and Resistance to Diseases and Insect Pests. To (1) isolate superior genotypes and recombine desirable traits insofar as possible into single varieties, (2) evaluate and characterize varieties and experimental strains, and (3) conduct studies on genetics and cytogenetics of lespedeza basic to development of sound and efficient breeding procedures.  
Agron. 52 (S-12)    Coop. ARS
- Ohio      Establishment and Maintenance of Forage Crop Stands. To (1) make investigations, fundamental and applied, relative to ecology and physiology of grass and legume seedlings, and (2) investigate phases of cultural management which affect growth and survival of an established stand of a forage crop.  
Ent., Bot., Agron., Pl. Physiol. 45
- Ohio      The Biology, Ecology and Control of Forage Crop Insects, with Special Emphasis on the Clover Root Borer, the Potato Leafhopper, the Sweet Clover Weevil and the Spittlebug. To study (1) seasonal history and biology of all insect species of economic importance to forage crop production; (2) ecological aspects of insect behavior and their relation to insect abundance and damage to forage crops; (3) relative effectiveness and economic value of application of insecticides; and (4) residual properties of insecticides as applied to foliage and soil for forage insect control.  
Ent., Agron., Dairy 68

Oreg.

Injurious Insects Affecting Forage Crops and Forage Crops Seed Production. Study (1) effects of insects on legume and grass seed production; (2) biology and life history of injurious insects associated with legume and grass seed production. (3) Survey insect species complex associated with grass seed fields. (4) Conduct and evaluate control measures.

Ent. 87

R. I.

Insect and Other Allied Pests of Forage Crops and Their Control Under Rhode Island Conditions. To (1) determine insect and other invertebrate pests of various forage legumes and grass associations by an annual survey; (2) obtain fundamental information on incidence and causes of attack of most important insect and other invertebrate species; (3) determine effect of various management practices on control of destructive insect and invertebrate organisms; (4) study use of various insecticidal materials for controlling such pests of forage plants; and (5) obtain information on relationships between various forage crop diseases and insect vectors.

Pl. Path., Eng. Chem. 607

S. C.

Insects Destructive to Forage and Pasture Plants. To (1) study distribution, relative abundance, importance and life history of insects known to be destructive to forage and pasture plants; and (2) develop effective methods for controlling those insects causing greatest damage.

Ent., Zool. 34

Vt.

Forage Crop Insects, Their Relative Importance and Control. (1) Learn role played by meadow spittlebug, the potato leafhopper, and other forage insects in reducing yields of legume forages grown for hay or silage and seed yields of birdsfoot trefoil. (2) Study prevalence and effect of clover root borer on red clover. (3) Develop practical and effective control measures for Vermont conditions.

Ent. 43 Coop. ARS



- Va.           Bionomics and Control of Insect Pests of Alfalfa, with Special Reference to the Alfalfa Weevil, the Meadow Spittlebug, and the Potato Leafhopper. (1) Obtain information on biology, ecology, and habits of alfalfa weevil; extend studies into realms of probable interest to other southern states. (2) Study seasonal history of meadow spittlebug and potato leafhopper in Virginia and correlate data with those reported from other areas. (3) Investigate chemical, cultural, and biological control. (4) Obtain data on economic losses of these insects. (5) Study life history and control of other forage insects of economic importance.  
Ent. 86055 (S-25)
- Wyo.           Control of Wyoming Range Grasshoppers. To determine (1) economic importance of various species of range grasshoppers, as to relative abundance of species on range, and food habits of species on range and extent of damage to forage plants; (2) long term results and economy of controlling grasshoppers on range land, including how long grasshopper numbers remain low after insecticidal treatment, and what the year-to-year fluctuations of grasshopper populations are in untreated areas; and (3) seasonal appearance of different species to provide necessary information for correct timing of spray treatments.  
Ent., Parasitol. 520 Coop. ARS
- Wyo.           The Biology and Ecology of Rangeland Grasshoppers in Wyoming. (1) Assemble a list of species of grasshoppers present on rangelands. (2-5 determine.) (2) Species responsible for economic losses and extent of damage caused by each. (3) Seasonal history of economically important species, (4) and study factors responsible for distribution of each species, (5) and study factors responsible for fluctuation in population numbers of economic important species, (6) Develop and recommend ways and means for management of rangeland grasshopper species to assure minimum damage to rangeland forage crops and maximum return from controls.  
Ent., Path., Agron. 609 (W-37)

VI. Insect Pests of Sugar Cane and Sugar Beets

- La.                    A Study of the Destructive and Beneficial Insects of Sugar Cane in Order to Develop Economical and Practical Measures of Controlling the Harmful Species. To determine or further refine and correlate control measures of the important insects attacking sugar cane through studies of biology of the pests and their natural enemies and insecticidal, cultural, and biological control practices for such insects as sugar cane borer, rootstock weevil, aphids, wireworms, nematodes, springtails, sugar cane beetle, parasites and predators.  
Ent. 581 Coop. ARS
- Minn.                Biology and Control of Injurious Insects on Sugar Beets in Minnesota. (1) Evaluate injury caused by injurious insects on sugar beets. (2) Identify species involved and make observations on their biologies. (3) Study ecological conditions under which injury occurs. (4) Study control methods in cooperation with American Crystal Sugar Co.  
Ent., Econ. Zool. 1736
- P. R.                Control of the Sugar Cane Moth-Borer, Diachtraea Saccharalis (Fabricius) in Puerto Rico. To determine (1) usefulness and effectiveness of insecticides, in control of sugar cane moth-borer; (2) proper time, intervals and number of applications of insecticides for effective borer control; and (3) minimum dosages per acre of insecticides to be applied in fields for an economical and effective borer control.  
Ent., Agron., Hort. 35
- P. R.                Transmission of the Chlorotic-Streak Virus of Sugar Cane by Insects. (1) Find insect vector(s) of chlorotic-streak virus of sugar cane. Study (2) relationship of virus to vector; (3) host range of virus among sugar cane varieties and related plant species (in greenhouse); (4) degree of susceptibility of cane varieties to streak virus under field conditions. (5) Devise methods to control disease.  
Pl. Path., Ent. 120 Coop. ARS

VII. Tobacco Insects

- Fla.            Influence of Cultural Practices on the Incidence and Control of Insect Infestations in Flue-Cured Tobacco. Learn influence of crop rotation, irrigation, fertilizer, and soil fumigation on kinds and numbers of insects attacking flue-cured tobacco, and develop methods of prevention and control.  
Ent., Agron. 780
- Ky.            Control of Subterraneous Insect Pests of Tobacco Plants. To determine phytotoxicity, possible stimulating effect, method of application, as well as the insecticidal action of some of the new organic insecticides for the control of wireworms, cutworms, and white grubs.  
Ent., Bot. 451
- Ky.            Control of Tobacco Hornworms. To develop new or improved insecticides for the control of Protoparce sexta Johanssen and Protoparce quinquimaculata Haworth.  
Ent., Bot. 458
- Ky.            Control of the Green Peach Aphid, Myzus Persicae (Sulz.), on Burley and Dark Tobacco. To determine the relative effectiveness of new organic insecticides or combinations of insecticides in control of green peach aphid on tobacco.  
Ent., Agron. 460
- N. C.           Insecticidal Control of Insects Attacking Flue-Cured and Burley Tobacco. (1) To evaluate the use of insecticides for the control of tobacco insects. (2) Improve application methods. (3) Learn relation of insect injury to yield and quality of tobacco.  
Ent. 47 Coop. ARS
- P. R.           Biology and Control of Tobacco Insects. (1) Obtain biological data on important insect pests affecting tobacco as flea beetles, tobacco aphid, and the tobacco horn worm. (2) Develop control measures.  
Ent. 113



Va.

Control of Insects Affecting the Production of Flue-Cured Tobacco. To (1) investigate control of the tobacco flea beetle in plantbeds, on newly set plants, and on field tobacco obtained from a. sprays and dusts applied to foliage, b. chlorinated hydrocarbon insecticides applied in transplant water; (2) investigate horn worms from the standpoints of a. insecticides effective in controlling both horn worms and other insects on tobacco, b. certain biological and ecological studies, and c. control with new type black-light traps; (3) determine the effectiveness of systemic insecticides applied in transplant water in controlling the green peach aphid and flea beetle; (4) determine the effects of new and promising insecticides on the flavor and aroma of tobacco products; and (5) develop control methods for other tobacco insects if they should constitute a major problem.

Ent. 86054

#### VIII. Control of Weeds by Insects

Idaho

Studies on the Ecology and Propagation of St. Johnswort Insects in Idaho. To (1) determine if 3 recently introduced species of St. Johnswort feeding insects can become established in Idaho; (2) conduct ecological and life history studies on all introduced St. Johnswort feeding insects; and (3) determine role of each St. Johnswort insect in control of this weed in Idaho.

Ent. 231 Coop. ARS, FS

IX. Regional Research

NC-20

Factors Influencing Corn Borer Populations. To measure seasonal changes in abundance of the European Corn Borer under cropping procedures practiced in the North Central States Region. To study the effect of time of planting, strain resistance or susceptibility, weather conditions, and character of plant growth on corn borer populations and the impact of these populations on corn yields. To accumulate and evaluate information on other biotic and physical factors that influence corn borer abundance.

Cooperating stations and agencies: Iowa II, Kans. II, Mo., II, Minn. II, Nebr. II, Ohio II, S. Dak. II\* ARS

NC-29

Migration of the Potato Leafhopper and its Causes. The potato leafhopper is an economically important insect possessing migratory habits typical of certain other destructive crop pests. The object of these studies is to determine the source, path and periodicities of migration of the leafhopper and its association with various ecological influences. The determination of the causes contributing to this insect's activity will supply useful information in predicting insect appearance and abundance and thus permit the development of more effective control measures.

Cooperating stations and agencies: Ill. I, Minn. I, Wis. I ARS

S-1

Genetics and Cytology of Cotton. 1. To accumulate, maintain, evaluate and utilize cotton species, interspecific hybrids, races and genetic types. 2. To produce interspecific hybrids and study their cytological and cytogenetic behavior. 3. To study the inheritance of quantitative and qualitative characters, including resistance to insects and other pests.

Cooperating stations and agencies: Ariz. III, Miss. III, Tex. III, ARS (See S-1 in Part 8, Section B for cooperators not doing research in entomology.)

\* The Roman numeral refers to the location in the summary of the contributing project title and objectives.

S-2

Mechanization of Cotton Production, Harvesting, Ginning and Cleaning. 1. To design and improve machines, including pesticide applicators, and develop methods which will reduce manpower requirements to a minimum and increase output per laborer to a maximum with respect to the growing of cotton and harvesting of cotton. 2. To design and improve facilities and develop methods for improvement in the storage and handling of cotton with emphasis on mechanically harvested cotton. To design and improve machines and facilities for the ginning and cleaning of cotton with emphasis on mechanically harvested cotton.

Cooperating stations and agencies: Miss. III, ARS (See S-2 in Part 3, Section B for cooperators not doing research in entomology.)

S-12

Production and Evaluation of Forage Crops and Pastures in the South. To develop more effective and efficient methods for determining the forage values of varieties and species of Southern pasture and forage plants grown singly and in combination under southern conditions. To determine basic genetics and breeding behavior of forage species and to develop and evaluate new and improved varieties and species adapted to the southern region. To determine the influence of specific environmental factors on the behavior of various strains, varieties and species of southern forage crops and to determine the response of these plants to variations in environments encountered in the region (resistance to insects and other pests is considered) and to soil and grazing management and fertilization practices. To develop improved methods of producing, harvesting, processing and storing seed of southern forage crops.

Cooperating stations and agencies: N. C. V, Okla. IV, Tex. IV, ARS (See S-12 in Part 10 for cooperators not doing research in entomology.)



S-25

The Biology and Control of Insects and Mites Attacking Forage Crops. To determine species and extent of injury of insects and/or mites injurious to forage crops, their life and/or seasonal cycles, habits, occurrence and distribution. To determine the relationship of ecological factors and cropping practices to insect and/or mite abundance and injury. To determine influence of predators, parasites, and the use of chemicals to control certain species on populations of other species of insects and/or mites. To develop practical control measures for the injurious species.

Cooperating stations and agencies: Ark. IV, Ga. V, Ky. I, La. V, Miss. V, Tenn. I, Tex. IV, Va. V ARS

S-37

Pink Bollworm Control. To investigate the biology and biological control of the pink bollworm. To evaluate cultural control practices and equipment, particularly those influencing winter survival. To develop effective chemical controls and coordinate these with the control of other cotton insect pests. To evaluate cotton types for resistance or tolerance.

Cooperating stations and agencies: Ark. III, Tex. III ARS, Oscar Johnston Foundation

W-37

The Biology, Ecology and Control of Rangeland Grasshoppers. Determine species of grasshoppers, type and amount of food (grass or forbs or shrubs) consumed or destroyed by each species, seasonal history and migratory habits, effect of soil types, vegetative types and density, topography, etc. on species distribution, factors of environment such as changes in habitat, etc. which are responsible for population fluctuations and develop and recommend practices for rangeland grasshopper control.

Cooperating stations and agencies: Calif. V, Colo. I, Idaho I, Mont. I, Wyo. V ARS

W-43

Leguminous Forage Crop Insect Pests. To determine the manner and extent to which yield factors such as stand and growth rates are influenced by the abundance and activities of insects. To determine the manner and extent to which quality factors such as germination, nutritive value and market acceptability are affected by abundance and activities of insects. To determine relation of insect population levels to economic injury. To determine factors influencing insect abundance and activity with special reference to control practice.

Cooperating stations and agencies: Ariz. IV, Calif. IV, Utah IV, Wash. IV, Wyo. IV ARS



LIST OF COMPILATIONS OF FEDERAL-GRANT RESEARCH PROJECTS  
AT STATE AGRICULTURAL EXPERIMENT STATIONS

ARS-23-8:		
Part :	Subject-Matter Area	Title of Section
Numbers :		
1	Agricultural Chemistry	Agricultural Chemistry
2	Agricultural Economics	a. Prices, Incomes, & General Studies of Com- modities & Industries b. Farm Management c. Land Economics d. Farm Finance & Taxation
3	Agricultural Engineering	a. Land & Water Use & Develop- ment b. Power Machinery & Equipment c. Farm Structures & Materials
4	Animal Husbandry	a. Beef Cattle b. Sheep & Goats c. Swine
5	Dairy Husbandry	Dairy Cattle
6	Dairy Technology	Dairy Technology
7	Entomology & Economic Zoology	a. Field Crop Insects b. Fruit, Nut & Vegetable Insects c. Miscellaneous Insects & Economic Zoology d. Insecticides
8	Field Crops	a. Cereal Crops b. Oil, Fiber, Tobacco & Sugar Crops
9	Food Science & Technology	a. Food Chemistry, Micro- biology, Sanitation & Public Health b. Food Engineering, Processing, Product and Process Develop- ment, Utilization and Waste Disposal c. Food Quality & Standards, Acceptance, Preference, & Marketing
10	Forage Crops, Pastures & Ranges	Forage Crops, Pastures & Ranges
11	Forestry	Forestry



ARS-23-8:			:
Part :	Subject-Matter Area	:	Title of Section
Numbers :		:	
12	Fruits & Nuts		Fruits & Nuts
13	Home Economics		a. Human Nutrition b. Housing c. Clothing & Textiles d. Foods-Consumer Quality & Utilization e. Household Economics & Management
14	Economics of Marketing		a. Field Crops b. Fruits & Vegetables c. Livestock, Meats & Wool d. Dairy Products e. Poultry & Poultry Products f. Forest Products & Ornamental & Drug Plants g. Cross-Commodity & Functional Studies
15	Meteorology		Meteorology
16	Ornamental & Drug Plants		Ornamental & Drug Plants
17	Plant Pathology & Bacteriology		a. Plant Pathology, Botany, & Diseases of Miscellaneous Crops b. Diseases of Field Crops c. Diseases of Fruit Crops d. Diseases of Vegetable Crops
18	Plant Physiology & Nutrition		Plant Physiology & Nutrition
19	Poultry Industry		Poultry Industry
20	Rural Sociology		Rural Life Studies
21	Soils		a. Soil Chemistry & Microbiology b. Soil Fertility, Management & Soil-Plant Relationships c. Soil Physical Properties, Conservation & Classification
22	Vegetables		a. Vegetable Crops b. Potatoes
23	Veterinary Science		Veterinary Science
24	Weeds		Weed Control



